<u>Work, Energy & Momentum Answers</u>

1. B (Aug. 1999 #6)
2. B (Aug. 1999 #7)
3. B (Aug. 1999 #8)
4. 0.11m (Aug. 1999 #2LA)
5. W = ΔE (Aug. 1999 #9LA)

   $\Delta E = \Delta E_K$ in this case **(1 mark)**

   $E_K = (1/2)mv^2$ **(1 mark)**, so velocity changing by a factor of two will cause kinetic energy to change by a factor of four **(1 mark)** and so the work done will become ever greater as the velocity increases by uniform amounts. **(1 mark)**

   OR

   $W = F \cdot d$ **(1 mark)**, but if the cyclist travels faster while exerting a constant force, for each uniform increment of velocity the distance travelled will become greater **(1 mark)** and greater. Hence $W = F \cdot d$ yields greater values for W as the distance becomes larger. **(2 marks)**
6. 3.4×10^2W (Jan. 1999 #6)
7. B (Jan. 1999 #7)
8. 3.2 N·s westward (Jan. 1999 #8)
9. a) 1.4×10^3J b) 5.8×10^2J c) 0.42 or 42% (Jan. 1999 #2LA)
10. In inelastic collisions, kinetic energy is not conserved. (Jan. 1999, #9 LA)

In collisions between cars there are skid marks, dents, pieces of twisted metal and loud sounds.

Each of these requires energy. This energy comes from the original kinetic energy.

Since an elastic collision requires conservation of kinetic energy, any collision producing one or more of the above observations must be inelastic.

11. A (Jun. 1999 #7)
12. 6.0 m/s, 36 J (Jun. 1999 #8)
13. 1.8×10^4 kg•m/s
14. 1.1×10^4 N (Jan. 2000 #7)
15. NOTE: Provincial exam long answer questions require <u>DETAILED</u> solutions. Study the marking criteria for this question:

$$E = E' \leftarrow \text{1 mark}$$

$$E_K + E_P + E_H = E_K' + E_P' + E_H' \leftarrow \text{2 marks}$$

$$\tfrac{1}{2}mv^2 + mgh = \tfrac{1}{2}m(v')^2 + E_H \leftarrow \text{1 mark}$$

$$\tfrac{1}{2}(45)(8.3)^2 + 4.5(9.8)(21) = \tfrac{1}{2}(45)(v')^2 + 3600 \leftarrow \text{1 mark}$$

$$1550 + 9260 = 22.5(v')^2 + 3600 \leftarrow \text{1 mark}$$

$$v' = 18 \text{ m/s} \leftarrow \text{1 mark}$$

OR

$E = E'$

$E_K + E_P + E_H = E_K' + E_P' + E_H'$ } 2 marks

$E_K = ½mv^2 = 1550$ J ← 1 mark

$E_K = mgh = 9\ 260$ J ← 1 mark

$E_K' = ½mv^2 = ½(45)(v')^2$ ← 1 mark

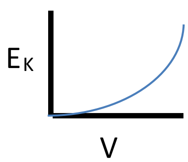
$E_H' = 3600$ J ← 1 mark

$v' = 18$m/s ← 1 mark

16. 5.1×10^3 J (Jan. 2000 #5)
17. D (Jan. 2000 #6)
18. 9.4 m/s, inelastic (Jan. 2000 #8)
19. 36 kg • m/s (Jan. 2000 #9)
20. 1.16×10^4 J, 193 N (Jan. 2000 #2 LA)
21. 50 $J/m^2/s^2$ OR 50 kg (Jan. 2000 #8 LA)

From graph: $E_K = kv^2$ and $E_K = 50v^2$, Since $E_K = ½ mv^2$

∴ Slope = ½ the mass of the motorbike.



22. 7.1 m/s (Jun. 2000 #8)
23. 0.52 OR 52% (Jun. 2000 #9)
24. A (June. 2000 #10)
25. 5.5 m/s, 32° below the horizontal (Jun. 2000, 2 LA)
26. 8.5×10^4 W (Aug. 2000 #7)
27. 4.85×10^3 J (Aug. 2000 #8)
28. 3.80×10^{-5} kg • m/s (Aug. 2000 #2 LA)
    2.25×10^4 N•s
    c) i) In an explosion, momentum must be conserved
       ii) Since the explosion adds energy to the system, the system will gain kinetic energy.
29. B (Aug. 2000 #9)
30. 6.0 m (Jan 2001 #2 LA)
31. A) 1.9×10^3 N•s
    B) Impulse or change in momentum
    C) $^1/_3$ (25000) = 8000 N, But over a longer time ← 1 mark
       The area should be the same ← 1 mark